INCH-POUND

MIL-DTL-55040C
27 October 2000
SUPERSEDING
MIL-C-55040B(MU)
30 December 1969

DETAIL SPECIFICATION

CABLE, SPECIAL PURPOSE, ELECTRICAL (RETRACTILE)

Inactive for new design after 27 October 2000

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers one type, single conductor, shielded, retractile electrical cable (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the applicable issues of these documents are those listed in the specific issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

A-A-59551 - Wire, Electrical, Copper (Uninsulated)

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be of use in improving this document should be addressed to: DSCC/VSS, P.O. Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 6145

STANDARDS

FEDERAL

FED-STD-228 - Cable and Wire, Insulated; Method of Testing.

(Unless otherwise indicated, copies of the above specifications and standards are available from the Document Automation and Production Service, DoDSSP, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Material.

3.1.1 Conductor. The conductor shall consist of 41 strands AWG (American Wire Gage) No. 40 tin-coated soft copper and shall conform to A-A-59551 (Type B, Class Q) except that the lay shall be right hand and 0.625 inch maximum.

3.1.2 Insulation. The stranded conductor shall be insulated with a rubber compound conforming to the following physical requirements, before and after accelerated aging in accordance with 4.7.2.4.

		Original	Aged
Tensile strength (minimum) pounds per square inch (psi)		600	450
Elongation	(minimum) percent	250	175
Set	(maximum) inch	0.5	--

3.1.2.1 Color. The color of the insulation applied over the conductor shall be white.

3.1.2.2 Dimensions. The overall diameter of the insulated conductor shall be 0.060±0.003 inches nominal and the wall thickness at any point shall not be less than 0.010 inch.

3.1.3 Shield. A shield shall be applied over the primary insulation and shall consist of a minimum 31 strands of AWG No. 36 tin-coated soft copper, layed parallel, helically wound around the insulation with 33 turns minimum per foot. The individual strands shall conform to A-A-59551 (type S).

3.1.4 Jacket. The insulation and shield shall be jacketed with a smooth compound of terpolymer of ethylene, propylene, and diene conforming to the following physical requirements before and after aging in accordance with 4.7.2.4.

		Original	Aged
Tensile strength (minimum) psi		1400	1300
Elongation	(minimum) percent	350	300

3.1.4.1 Color. The color of the jacket shall be black.

3.1.4.2 Dimensions. The overall diameter of the jacket shall be 0.160±0.010 inch and the wall thickness shall not be less than .025 inch.

3.2 Construction. The jacketed electrical cable shall be helical in form with adjacent turns contiguous to form a helical cable having a straight length of cable on each end tangent to the helical coil. The finished electrical cable shall have a left lay in its helical section. The finished cable shall have a smooth and uniform jacket. The helix diameter shall be 0.56±0.06 inch. The length of the helical portions and the length of the straight ends shall be as specified by the procuring activity (see 6.2).

3.3 Performance.

3.3.1 Conditioning. The electrical cable shall be capable of returning to its original contiguous position after extension of the coiled portion of the cable to 5 times its retracted length for 6 cycles.

3.3.2 Life cycle. The cable shall have a life cycle of 5000 cycles when extended to 4 times its retracted length at a rate not less than 18 cycles per minute (cpm) and shall be capable of returning to within 20 percent of its original retracted length within one hour after completion of the cycling. The change in resistance of the conductor at any time during the life cycle of the cable shall not exceed 10 percent of its original resistance.

3.3.3 Extended length. The finished cable shall have a minimum extended length of 2-1/2 times its retracted length under a load of 6 ounces.

3.3.4 Set. After being extended horizontally to 5 times its retracted length and immediately released, the cable shall return to within 20 percent of its original length within 5 minutes.

3.3.5 Static load. The cable, extended vertically to a length 2-1/2 times its retracted length for a period of 48 hours, shall return to not more than 115 percent of its original retracted length within 30 minutes after release from restraint.

3.3.6 Retraction at low temperature. The cable shall be capable of being extended to 4 times its retracted length without fracture of the conductor, conductor insulation, or jacket when subjected to the test specified in 4.7.3.6. When released from its extended position, the cable shall retract to not more than 250 percent of its retracted length within 30 seconds.

3.3.7 Voltage withstand. The electrical cable shall not show any signs of dielectric breakdown when subjected to the tests in 4.7.3.7.

3.3.8 Insulation resistance. The minimum value for insulation resistance shall be 1000 megohms when the cable is subjected to the test in 4.7.3.8.

3.4 Workmanship. The cable shall be free of kinks, abrasions, and cracked or peeled surfaces. The cable shall be a uniform and consistent product and shall be free from defects, dirt or foreign substances that adversely affect the serviceability of the product.

4. VERIFICATION

4.1 Requirements cross-reference matrix. Table I provides a cross-reference matrix of section 3 requirements tested or verified in the paragraphs below.

TABLE I. Requirements cross-reference matrix.

Requirement	Verification	Requirement	Verification
3.1.1	4.7.1	3.3.1	4.7.3.1
3.1.2	4.7.1, 4.7.2	3.3.2	4.7.3.2
3.1.2.1	4.7.1	3.3.3	4.7.3.3
3.1.2.2	4.7.1	3.3.4	4.7.3.4
3.1.3	4.7.1	3.3.5	4.7.3.5
3.1.4	4.7.1, 4.7.2	3.3.6	4.7.3.6
3.1.4.1	4.7.1	3.3.7	4.7.3.7
3.1.4.2	4.7.1	3.3.8	4.7.3.8
3.2	4.7.1	3.4	4.7.1

4.2 Classification of inspections. The inspection requirements specified herein are classified as conformance inspections:

a. Individual inspection (see 4.4).

b. Sampling inspection (see 4.5).

c. Periodic inspection (see 4.6).

4.3 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be conducted under the following ambient conditions: 77±18 °F, site pressure, and site uncontrolled relative humidity.

4.4 Individual inspection. Unless otherwise specified (see 6.2), each cable shall be inspected in accordance with the individual inspections specified in table II.

TABLE II. Conformance inspections.

Inspection	Requirement	Verification	Conformance inspections		
			Individual	Sampling	Periodic
Visual & Mechanical					
Material	3.1.1, 3.1.2 3.1.3, 3.1.4	4.7.1		X	
Color	3.1.2.1, 3.1.4.1	4.7.1	X		
Dimensions	3.1.2.2, 3.1.4.2	4.7.1	X		
Construction	3.2	4.7.1	X		
Workmanship	3.4	4.7.1	X		
Material tests					
Tensile strength	3.1.2, 3.1.4	4.7.2.1		X	
Elongation	3.1.2, 3.1.4	4.7.2.2		X	
Set	3.1.2	4.7.2.3		X	
Accelerated aging	3.1.2, 3.1.4	4.7.2.4		X	
Performance tests					
Conditioning	3.3.1	4.7.3.1		X	
Life cycle	3.3.2	4.7.3.2			X
Extended length	3.3.3	4.7.3.3		X	
Set	3.3.4	4.7.3.4		X	
Static load	3.3.5	4.7.3.5		X	
Retraction at low temperature	3.3.6	4.7.3.6		X	
Voltage withstand	3.3.7	4.7.3.7		X	
Insulation resistance	3.3.8	4.7.3.8		X	

4.5 Sampling inspection. Unless otherwise specified (see 6.2), sampling inspection shall consist of the inspections specified in table II. These sampling inspections shall be performed on a production lot basis. Each lot shall consist of units of product manufactured under essentially the same conditions, and at essentially the same time. The unit of product shall be each finished cable. The inspection sample shall be product selected at random from the production lot without regard to quality and shall be of the size specified in table III. If one or more defects are found in the inspection sample, the production lot shall be rejected and shall not be supplied to this specification.

TABLE III. Inspection sample.

Production Lot size 1/	Sample size
1	1
2 to 8	2
9 to 15	3
16 to 25	5
26 to 50	8
51 to 90	13
91 to 150	20
151 to 280	32
281 to 500	50
501 to 1200	80
1201 to 3200	125
3201 to 10000	200
10001 to 35000	315

1/ Lot size will be based on number of units of product.

4.6 Periodic inspection. Unless otherwise specified (see 6.2), the periodic inspection shall consist of the life cycle test (see table II and 4.7.3.2). One sample per 500 units, or as specified by the procuring activity (see 6.2), shall be selected for this inspection. If a sample fails to pass this inspection, the manufacturer shall notify the cognizant inspection activity of such failure. Corrective action shall be taken on the materials or processes, and on all units of product that were manufactured under essentially the same conditions and considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the procuring activity has been taken. After corrective action, the life cycle test shall be repeated on additional sample units as specified by the procuring activity (see 6.2). Final acceptance and shipment shall be withheld until the re-inspection has shown that the corrective action was successful.

4.7 Methods of inspection.

4.7.1 Visual and mechanical inspection. The cable shall be inspected to verify that the material, dimensions, color, construction, and workmanship are in accordance with the applicable requirements.

4.7.2 Material tests.

4.7.2.1 Tensile strength. The insulation and jacket shall meet or exceed the minimum values of 3.1.2 or 3.1.4, as applicable, when tested in accordance with method 3021 of FED-STD-228.

4.7.2.2 Elongation. The insulation and jacket shall meet or exceed the minimum values of 3.1.2 or 3.1.4, as applicable, when tested in accordance with method 3031 of FED-STD-228.

4.7.2.3 Set. The insulation shall not exceed the maximum values of 3.1.2 when tested in accordance with method 3161 of FED-STD-228, with the following exceptions:

a. Bench marks shall be 2 inches apart.

b. The test specimen shall be stretched so that the distance between bench marks is 6 inches; they shall be released within 5 seconds.

c. Set shall be determined one minute after beginning of release.

4.7.2.4 Accelerated aging. The insulation and jacket shall conform to the minimum aged values of 3.1.2 or 3.1.4, as applicable, when tested in accordance with method 4011 of FED-STD-228, except that the aging period shall be 96±0.5 hours.

4.7.3 Performance tests.

4.7.3.1 Conditioning. The cable, prior to any extension and retraction tests, shall first be conditioned by extending the coiled portion to 5 times its retracted length a total of 6 times and allowing it to retract freely each time. The cable shall then conform to 3.3.1 when laid on a horizontal surface.

4.7.3.2 Life cycle. The resistance of the conductor shall be measured and recorded before start of the cycling test. The cable shall then be clamped in a suitable testing machine and extended to 4 times its retracted length for 5,000 cycles at a rate of not less than 18 cycles per minute. After completion of the test, the retracted length and resistance values shall be in accordance with 3.3.2.

4.7.3.3 Extended length. The finished cable shall be positioned vertically and a load of 6 ounces applied to the end. Measurement under suspension shall conform to 3.3.3.

4.7.3.4 Set. The cable shall be extended to 5 times its retracted length, immediately released, and then measured for compliance with 3.3.4.

4.7.3.5 Static load. The finished cable shall be extended between two adjustable clamps fastened to a vertical support so that the coiled portion of the cable is stretched to 250 percent of its original retracted length. After 48 hours, the cable shall be released from its extended position and freed from restraint by tapping on a horizontal surface and laid in a relaxed position. After being placed at rest on the horizontal surface for a period of 30 minutes, the cable shall be measured to determine compliance with 3.3.5.

4.7.3.6 Retraction at low temperature. The finished electrical cable shall be placed in a temperature-controlled chamber for not less than 20 hours at a temperature of -65±2 °F. At the end of the period and without removal from the chamber, the cable shall be extended to 4 times its retracted length and then released on a horizontal surface. While still at the -65 °F temperature, the cable shall be freed from restraint by tapping on the surface and measured to determine compliance with 3.3.6.

4.7.3.7 Voltage withstand. The voltage withstand test shall be conducted in accordance with method 6111 of FED-STD-228, with 500 volts dc being applied between the conductor and the shield for a minimum of 5 seconds, to determine compliance with 3.3.7.

4.7.3.8 Insulation resistance. The insulation resistance test shall be conducted in accordance with method 6031 of FED-STD-228, using a voltage of 500 volts dc, to determine compliance with 3.3.8.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department or Defense Agency automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES (This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This specification is being retained as a military detail specification because of environmental requirements, including operation at temperatures to -65 °F. The cables procured under this specification will be used for wiring instrument lights on fire control equipment and selected general applications. In use the cable will be subjected to rough handling and extreme weather conditions. Material used in the fabrication of these cables is not intended for extended exposure to oil.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1).

c. The length of the cable helical portions, and the length of the straight ends (see 3.2).

d. Inspection conditions, if other than as specified (see 4.3).

e. Conformance inspections, if other than as specified (see 4.4, 4.5, and 4.6).

f. Number of units to be subjected to the periodic test, if other than as specified (see 4.6).

g. Number of units to be re-inspected upon periodic inspection failure (see 4.6).

h. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

Accelerated aging
Helical
Life cycle
Shield
Tensile test

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

CONCLUDING MATERIAL

Custodians:
Army - AR
DLA - CC

Preparing activity:
DLA - CC

(Project 6145-2244)

Review activities:
Army - AT, MI

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3 The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** **MIL-DTL-55040C**	**2. DOCUMENT DATE** *(YYYYMMDD)* **20001027**

3. DOCUMENT TITLE

Cable, Special Purpose, Electrical (Retractile)

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include zip code)*	d. TELEPHONE *(Include Area Code)* (1) Commercial: (2) DSN: *(if applicable)*	7. DATE SUBMITTED *(YYYYMMDD)*

8. PREPARING ACTIVITY

a. NAME Defense Logistics Agency Defense Supply Center, Columbus	b. TELEPHONE *(Include Area Code)* Commercial: 614-692-0538 DSN: 850-0538
c. ADDRESS *(Include Zip Code)* DSCC-VAI P.O. Box 3990 Columbus, Ohio 43216-5000	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** **Defense Standardization Program Office (DLSC-LM)** **8725 John J. Kingman Road, Suite 2533** **Fort Belvoir, Virginia 22060-6621** **Telephone: 703-767-6888 DSN 427-6888**

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